

Claims:

1. An external fixation component comprising:
- (a) a first capture member adapted to capture an element of an orthopedic fixation system; and
 - (b) a second capture member adapted to capture an element of an orthopedic fixation system and coupled to the first capture member such that the coupling allows the first capture member and the second capture member to rotate about three axes relative to each other;
- wherein the coupling is adapted to secure the first and second capture members from rotation with a single activation.
2. The component of claim 1 wherein one capture member may be locked while the other capture member is capable of rotation.
3. The component of claim 1 wherein each of the first and second capture members further comprise a base and a head.
4. The component of claim 3 further comprising:
- (a) a connector;
 - (b) internal threads in an aperture of the base of the first capture member,
- wherein the aperture is adapted to receive a first fastener;

(c) a first fastener comprising a threaded end adapted to mate with the internal threads of the base;

(d) a biasing member adjacent an end of the connector and wherein the threaded end of the first fastener is adjacent the biasing member; and

(e) threads on a second portion of the connector adapted to mate with threads on a second fastener.

5. The component of claim 4 wherein tightening the first fastener locks the first capture member and tightening the second fastener locks the second capture member.

6. The component of claim 3 wherein the head of each capture member further comprises a grip surface.

7. The component of claim 3 wherein the head of each of the capture members further comprises a wedge and the base of each of the capture members further comprises a groove.

8. The component of claim 7 wherein the wedge and groove of each capture member form a channel adapted to receive a fixation element.

9. The component of claim 7 wherein the grooves further comprise splines.

10. The component of claim 1 wherein each of the first and second capture members comprise:

- (a) a base; and
- (b) a head slidably coupled to the base;

wherein the base slides transverse to the longitudinal axis of the fixation element, and the head is biased toward the fixation element.

11. The component of claim 10 wherein the base and head each further comprise at least one track along which the head and base translate with respect to each other.

12. The component of claim 10 wherein the base further comprises a stop and the head further comprises a recess adapted to receive a biasing member.

13. The component of claim 1 wherein one capture member is adapted to receive a bar and the other capture member is adapted to receive a pin.

14. The component of claim 1 wherein each capture member is adapted to receive a bar.

15. The component of claim 1 wherein one capture member is adapted to receive a bar and the other capture member is adapted to receive a wire.

16. The component of claim 1 wherein one capture member is adapted to receive a ring and the other capture member is adapted to receive a bar.

17. An external fixation component comprising:

(a) a first capture member comprising a planetary member and adapted to receive a fixation element; and

(b) a second capture member comprising a cooperating surface adapted to receive the planetary member, the second capture member adapted to receive a fixation element,
wherein one capture member is capable of rotation in more than one axis relative to the other capture member.

18. The component of claim 17 wherein at least one of the planetary member and cooperating surface is generally spherical.

19. The component of claim 17 wherein at least one of the inner surface of the planetary member and cooperating surface is tapered.

20. The component of claim 17 wherein one capture member is capable of rotation in three axes relative to the other capture member.

21. The component of claim 17 wherein one capture member may be locked while the other capture member is capable of rotation.

22. The component of claim 17 wherein each of the capture members further comprise a base and a head.

23. The component of claim 22 wherein the head of each of the capture members further comprises a wedge and the base of each of the capture members further comprises a groove.

24. The component of claim 23 wherein the wedge and groove of each capture member form a channel adapted to receive a fixation element.

25. The component of claim 23 wherein the grooves further comprise splines.

26. The component of claim 17 wherein the capture members each further comprise:

- (a) a base; and
- (b) a head slidably coupled to the base;

wherein the head slides transverse to the longitudinal axis of the fixation element, and the head is biased toward the fixation element.

27. The component of claim 26 wherein the base and head each further comprise at least one track along which the base and head translate with respect to each other.

28. The component of claim 26 wherein the base further comprises a stop and the head further comprises a recess adapted to receive a biasing member.

29. The component of claim 17 wherein one capture member is adapted to receive a bar and the other capture member is adapted to receive a pin.

30. The component of claim 17 wherein each capture member is adapted to receive a bar.

31. The component of claim 17 wherein one capture member is adapted to receive a bar and the other capture member is adapted to receive a wire.

32. The component of claim 17 wherein one capture member is adapted to receive a ring and the other capture member is adapted to receive a bar.

33. A capture member for retaining a fixation element of an external fixation system, the capture member comprising:

- (a) a base; and
- (b) a head slidably coupled to the base;

wherein the head slides transverse to the longitudinal axis of the fixation element, and the head is biased toward the fixation element.

34. The component of claim 33 wherein the base and head each further comprise at least one track along which the base and head translate with respect to each other.

35. The component of claim 33 wherein the base further comprises a stop and the head further comprises a recess adapted to receive a biasing member.

36. The component of claim 33 wherein the base further comprises a wedge and the head further comprises a groove, the wedge and groove together forming a channel adapted to receive a fixation element.

37. The component of claim 33 wherein the capture member is adapted to receive a bar.

38. The component of claim 33 wherein the capture member is adapted to receive a pin.

39. The component of claim 33 wherein the capture member is adapted to receive a wire.

40. The component of claim 33 wherein the capture member is adapted to receive a ring.

41. An external fixation component comprising:

(a) a first capture member comprising:

(i) a planetary member having inner and outer surfaces and including an aperture adapted to receive a connector,

(ii) structure adapted to capture a fixation element; and

(b) a second capture member comprising:

(i) a cooperating surface adapted to receive and correspond generally in shape with the outer surface of the planetary member and an aperture adapted to receive a connector,

(ii) structure adapted to capture a fixation element; and

(c) a connector comprising:

(i) a first portion that corresponds generally in shape to and is adapted to be received in the inner surface of the planetary member, and

(ii) a second portion adapted to extend through the aperture in the cooperating surface of the second capture member;

wherein when the first portion of the connector is urged against the inner surface of the planetary member and locked, and the outer surface of the planetary member is urged against the cooperating surface and locked, the fixation components are oriented and locked in position relative to each other, and

wherein when unlocked, each capture member is able to rotate about more than one axis relative to the other capture member.

42. The component of claim 41 wherein the first portion of the connector comprises an end and the second portion of the connector comprises a shaft.

43. The component of claim 41 wherein the connector further comprises a key adapted to be received in a slot in the second capture member.

44. The component of claim 41 wherein the first portion of the connector is generally spherical.

45. The component of claim 41 further comprising a biasing member adjacent the first portion of the connector.

46. The component of claim 41 wherein the planetary member is generally spherical.

47. The component of claim 41 wherein the cooperating surface is generally spherical.

48. The component of claim 41 wherein the inner surface of the planetary member is tapered.

49. The component of claim 41 wherein the cooperating surface is tapered.

50. The component of claim 41 wherein the planetary member is textured.

51. The component of claim 41 wherein the cooperating surface is textured.

52. The component of claim 41 wherein the cooperating surface comprises tungsten cobalt carbide and has a coating.

53. The component of claim 41 wherein the planetary member further comprises a mechanical locking pattern.

54. The component of claim 53 wherein the mechanical locking pattern comprises splines.

55. The component of claim 41 wherein the cooperating surface further comprises a mechanical locking pattern.

56. The component of claim 55 wherein the mechanical locking pattern comprises splines.

57. The component of claim 41 wherein the first capture member is capable of rotating in three axes relative to the second capture member.

58. The component of claim 41 wherein the second capture member is capable of rotating in three axes relative to the first capture member.

59. The component of claim 41 wherein one capture member may be locked while the other capture member is capable of rotation.

60. The component of claim 41 wherein each of the first and second capture members further comprise a base and a head.

61. The component of claim 60 further comprising:

(a) internal threads in an aperture of the base of the first capture member, wherein the aperture is adapted to receive a first fastener;

(b) a first fastener comprising a threaded end adapted to mate with the internal threads of the base;

(c) a biasing member adjacent the end of the connector and wherein the threaded end of the first fastener is adjacent the biasing member; and

(d) threads on the second portion of the connector adapted to mate with threads on a second fastener.

62. The component of claim 61 wherein tightening the first fastener locks the first capture member and tightening the second fastener locks the second capture member.

63. The component of claim 60 wherein the head of each capture member further comprises a grip surface.

64. The component of claim 60 wherein the head of each of the capture members further comprises a wedge and the base of each of the capture members further comprises a groove.

65. The component of claim 64 wherein the wedge and groove of each capture member form a channel adapted to receive a fixation element.

66. The component of claim 64 wherein the grooves further comprise splines.

67. The component of claim 41 wherein each of the first and second capture members comprise:

- (a) a base; and
- (b) a head slidably coupled to the base;

wherein the base slides transverse to the longitudinal axis of the fixation element, and the head is biased toward the fixation element.

68. The component of claim 67 wherein the base and head each further comprise at least one track and wherein the head and base translate with respect to each other along the at least one track of the base and the at least one track of the head.

69. The component of claim 41 wherein the base further comprises a stop and the head further comprises a recess adapted to receive a biasing member.

70. The component of claim 41 wherein one capture member is adapted to receive a bar and the other capture member is adapted to receive a pin.

71. The component of claim 41 wherein each capture member is adapted to receive a bar.

72. The component of claim 41 wherein one capture member is adapted to receive a bar and the other capture member is adapted to receive a wire.

73. The component of claim 41 wherein one capture member is adapted to receive a ring and the other capture member is adapted to receive a bar.

74. The component of claim 41 wherein the first and second capture members each comprise a slot extending toward an end of the capture members.

75. An external fixation component comprising:

- (a) a first capture member comprising
- (i) a planetary member having inner and outer surfaces and including an aperture adapted to receive a connector,
 - (ii) a channel adapted to receive a ring having a rectangular cross section; and
- (b) a second capture member comprising
- (i) a cooperating surface adapted to receive the planetary member and an aperture adapted to receive a connector,
 - (ii) a channel adapted to receive a bar; and
- (c) a connector comprising
- (i) an end, and
 - (ii) a shaft;

wherein the shaft of the connector is received in the apertures of the first and second capture members and wherein the end of the connector is received in the planetary member and the planetary member is received in the cooperating surface.

76. The component of claim 75 further comprising:

- (a) a rod comprising

- (i) a first threaded end adapted to be received in the first capture member, and
- (ii) a second threaded end adapted to be received in a first fastener;
- and
- (b) a biasing element.

77. An external fixation system comprising;

a plurality of fixation elements; and

a plurality of fixation components comprising:

a first capture member adapted to capture an element of an orthopedic fixation system; and

a second capture member adapted to capture an element of an orthopedic fixation system and coupled to the first capture member such that the coupling allows the first capture member and the second capture member to rotate about three axes relative to each other;

wherein the coupling is adapted to secure the first and second capture members from rotation with a single activation.

78. The component of claim 77 wherein the fixation elements comprise at least one bar.

79. The component of claim 77 wherein the fixation elements comprise at least one pin.

80. The component of claim 77 wherein the fixation elements comprise at least one wire.

81. The component of claim 77 wherein the fixation elements comprise at least one ring.

82. The component of claim 77 wherein one capture member may be locked while the other capture member is capable of rotation.

83. The component of claim 77 wherein each of the first and second capture members further comprise a base and a head.

84. The component of claim 77 further comprising:

- (a) a connector;
- (b) internal threads in an aperture of the base of the first capture member, wherein the aperture is adapted to receive a first fastener;
- (c) a first fastener comprising a threaded end adapted to mate with the internal threads of the base;

(d) a biasing member adjacent an end of the connector and wherein the threaded end of the first fastener is adjacent the biasing member; and

(e) threads on a second portion of the connector adapted to mate with threads on a second fastener.

85. The component of claim 84 wherein tightening the first fastener locks the first capture member and tightening the second fastener locks the second capture member.

86. The component of claim 83 wherein the head of each capture member further comprises a grip surface.

87. The component of claim 83 wherein the head of each of the capture members further comprises a wedge and the base of each of the capture members further comprises a groove.

88. The component of claim 87 wherein the wedge and groove of each capture member form a channel adapted to receive a fixation element.

89. The component of claim 87 wherein the grooves further comprise splines.

90. The component of claim 77 wherein each of the first and second capture members comprise:

- (a) a base; and
(b) a head slidably coupled to the base;

wherein the base slides transverse to the longitudinal axis of the fixation element, and the head is biased toward the fixation element.

91. The component of claim 90 wherein the base and head each further comprise at least one track along which the head and base translate with respect to each other.

92. The component of claim 90 wherein the base further comprises a stop and the head further comprises a recess adapted to receive a biasing member.

93. The component of claim 77 wherein one capture member is adapted to receive a bar and the other capture member is adapted to receive a pin.

94. The component of claim 77 wherein each capture member is adapted to receive a bar.

95. The component of claim 77 wherein one capture member is adapted to receive a bar and the other capture member is adapted to receive a wire.

96. The component of claim 77 wherein one capture member is adapted to receive a ring and the other capture member is adapted to receive a bar.

97. A method of treating a skeletal condition or injury using an external fixation system, the method comprising:

- (a) inserting a first fixation element into a bone;
- (b) capturing the first fixation element in a first fixation component, the component comprising:
 - (i) a first capture member adapted to capture an element of an orthopedic fixation system; and
 - (ii) a second capture member adapted to capture an element of an orthopedic fixation system and coupled to the first capture member such that the coupling allows the first capture member and the second capture member to rotate about three axes relative to each other;wherein the coupling is adapted to secure the first and second capture members from rotation with a single activation;
- (c) capturing a second fixation element in the first fixation component; and
- (d) engaging the single activation to secure the first and second capture members from rotation.

98. The method of claim 97 further comprising joining one of the first fixation element or the second fixation element to a second component, forming a frame.

99. The method of claim 98 further comprising adjusting the frame by loosening one capture member of any fixation component and moving the frame.

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